

WE CLAIM:

1. A leadframe for use with integrated circuit chips comprising:

5 a plated layer of gold selectively covering areas of said leadframe intended for solder attachment;

and

 said gold layer providing a visual distinction to said areas.

- 10 2. A leadframe for use with integrated circuit chips, having a chip mount pad and a plurality of lead segments, comprising:

 a leadframe base made of copper or copper alloy;

15 a first layer of nickel deposited on said copper or copper alloy;

 a layer of an alloy of nickel and palladium on said first nickel layer;

 a second layer of nickel on said alloy layer, said second nickel layer deposited to be suitable for bending of said lead segments, wire bonding, and solder attachment;

20 a layer of palladium, said palladium layer deposited to be suitable for protecting the nickel surface for wire bonding and solderability, and for adhesion to molding compound; and

25 a layer of gold selectively covering areas of said lead segments intended for solder attachment,

said

 layer of gold providing a visual distinction to said areas and having a thickness to optimize solder attachment.

- 30 3. The leadframe according to Claim 2 wherein said gold

layer has a thickness in the range from 2 to 5 nm.

4. The leadframe according to Claim 2 wherein said first
nickel layer has a thickness in the range from 50 to
150

5 nm.

5. The leadframe according to Claim 2 wherein said alloy
layer has a thickness in the range from 50 to 150 nm.

6. The leadframe according to Claim 2 wherein said second
nickel layer has a thickness in the range from 1000 to
10 3000 nm.

7. The leadframe according to Claim 2 wherein said
palladium layer has a thickness in the range from 25 to
75 nm.

8. The leadframe according to Claim 2 wherein said copper
15 or copper alloy base has a thickness between about 100
and 250 μm .

9. The leadframe according to Claim 2 wherein said solder
attachment comprises solder materials selected from a
group consisting of tin/lead, tin/indium, tin/silver,
20 tin/bismuth and conductive adhesive compounds.

10. The leadframe according to Claim 1 wherein said
leadframe comprises an iron-nickel alloy or invar base,
selectively plated with gold.

11. A semiconductor device comprising:

25 a leadframe comprising a chip mount pad for an
integrated circuit chip and a plurality of lead
segments having their first end near said mount
pad and their second end remote from said mount
pad;

30 said leadframe having a first surface layer of
nickel, a layer of an alloy of nickel and
palladium, a second layer of nickel, and a layer

of palladium;
said leadframe further having an outermost layer of gold selectively covering said second ends of
said

5 lead segments in a thickness suitable to optimize solder attachment;

an integrated circuit chip attached to said mount pad;

bonding wires interconnecting said chip and said
10 first ends of said lead segments;

encapsulation material surrounding said chip,
bonding
wires and said first ends of said lead segments,
whereby the adhesion between said encapsulation
15 material and said surrounded parts is maximized;
and
said encapsulation material leaving said second ends
of said lead segments exposed, whereby the solder
attachment to said gold layer is maximized.

20 12. The device according to Claim 11 wherein said bonding wires are selected from a group consisting of gold, copper, aluminum and alloys thereof.

13. The device according to Claim 11 wherein the bonding wire contacts to said first ends of said lead segments
25 comprise welds made by ball bonds, stitch bonds, or wedge bonds.

14. The device according to Claim 11 wherein said encapsulation material is selected from a group consisting of epoxy-based molding compounds suitable
30 for
adhesion to said leadframe.

15. The device according to Claim 11 further comprising lead

segments having said second ends bent, whereby said segments obtain a form suitable for solder attachment.

5 16. A method for fabricating a leadframe comprising a chip mount pad and a plurality of lead segments having their first end near said mount pad and their second end remote from said mount pad, comprising the steps of:

10 selectively masking said chip pad and said first segment ends, thereby leaving said second segment ends exposed; and

15 plating a layer of gold on said exposed segment ends in a thickness suitable to optimize solder attachment, thereby creating a visual distinction between the gold-plated and unplated leadframe areas.

17. A method for fabricating a leadframe comprising the steps of:

20 providing a copper leadframe having a mount pad for an integrated circuit chip and a plurality of lead

25 segments having their first end near said mount pad and their second end remote from said mount pad;

cleaning said leadframe in alkaline soak cleaning and

alkaline electrocleaning;

activating said leadframe by immersing said leadframe

30 into an acid solution, thereby dissolving any copper oxide;

immersing said leadframe into an electrolytic nickel

- plating solution and depositing a first layer of nickel onto said copper;
- electroplating a layer comprising an alloy of nickel and palladium;
- 5 electroplating a second layer of nickel, thereby adapting said lead segments for mechanical bending;
- electroplating a layer of palladium;
- selectively masking said chip pad and said first
- 10 segment ends, thereby leaving said second segment ends exposed; and
- plating a layer of gold on said exposed segment ends in a thickness suitable to optimize solder attachment, thereby creating a visual distinction
- 15 between the gold-plated and unplated leadframe areas.
18. The method according to Claim 17 wherein said gold plating is performed electrolytically or electrolessly.
19. The method according to Claim 17 wherein said masked
- 20 parts of said leadframe comprise the leadframe areas to be encapsulated by molding compound.
20. The method according to Claim 17 wherein the process steps are executed in sequence without time delays, yet including intermediate rinsing steps.
- 25 21. The method according to Claim 17 wherein said acid solution may be sulfuric acid, hydrochloric acid or any other acid.
22. A method for fabricating a leadframe comprising the steps of:
- 30 providing a copper leadframe having a mount pad for an integrated circuit chip and a plurality of lead

segments having their first end near said mount pad and their second end remote from said mount pad;

cleaning said leadframe in alkaline soak cleaning

5 and

alkaline electrocleaning;

activating said leadframe by immersing said leadframe

into an acid solution, thereby dissolving any
10 copper oxide;

electroplating a layer of nickel, thereby adapting
said lead segments for mechanical bending;

electroplating a layer of palladium;

selectively masking said chip pad and said first
15 segment ends, thereby leaving said second segment
ends exposed; and

plating a layer of gold on said exposed segment ends
in a thickness suitable to optimize solder
attachment, thereby creating a visual distinction
between the gold-plated and unplated leadframe
20 areas.